

SEQUENCE LISTING

(1) GENERAL INFORMATION:

- (i) APPLICANT: Takaaki Sato and Junn Yanagisawa
- (ii) TITLE OF INVENTION: COMPOUNDS THAT INHIBIT THE
INTERACTION BETWEEN SIGNAL-TRANSDUCING
PROTEINS AND THE GLGF (PDZ/DHR) DOMAIN AND
USES THEREOF
- (iii) NUMBER OF SEQUENCES: 33
- (iv) CORRESPONDENCE ADDRESS:
 - (A) ADDRESSEE: Cooper & Dunham LLP
 - (B) STREET: 1185 Avenue of the Americas
 - (C) CITY: New York
 - (D) STATE: New York
 - (E) COUNTRY: U.S.A.
 - (F) ZIP: 10036
- (v) COMPUTER READABLE FORM:
 - (A) MEDIUM TYPE: Floppy disk
 - (B) COMPUTER: IBM PC compatible
 - (C) OPERATING SYSTEM: PC-DOS/MS-DOS
 - (D) SOFTWARE: PatentIn Release #1.0, Version #1.30
- (vi) CURRENT APPLICATION DATA:
 - (A) APPLICATION NUMBER: Not Yet Known
 - (B) FILING DATE: 18-JUL-1997
 - (C) CLASSIFICATION:
- (viii) ATTORNEY/AGENT INFORMATION:
 - (A) NAME: White, John P
 - (B) REGISTRATION NUMBER: 28,678
 - (C) REFERENCE/DOCKET NUMBER: 0575/48962-A-PCT-US
- (ix) TELECOMMUNICATION INFORMATION:
 - (A) TELEPHONE: (212) 278-0400
 - (B) TELEFAX: (212) 391-0525

(2) INFORMATION FOR SEQ ID NO:1:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 4 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: peptide
- (ix) FEATURE:
 - (A) NAME/KEY: Peptide
 - (B) LOCATION: 1
 - (D) OTHER INFORMATION: /product= "OTHER"/note= "Xaa= Gly/Ser/Ala/Glu"
- (ix) FEATURE:
 - (A) NAME/KEY: Protein
 - (B) LOCATION: 4
 - (D) OTHER INFORMATION: /product= "OTHER"/note= "Xaa= Phe/Ile/Leu"
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:1:

Xaa Leu Gly Xaa
1

(2) INFORMATION FOR SEQ ID NO:2:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 6 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(ix) FEATURE:

 (A) NAME/KEY: Peptide
 (B) LOCATION: 1
 (D) OTHER INFORMATION: /product= "OTHER"
/note= "Xaa=Lys/Arg/Gln"

(ix) FEATURE:

 (A) NAME/KEY: Peptide
 (B) LOCATION: 2
 (D) OTHER INFORMATION: /product= "OTHER"
/note= "Xaa= Gly/Ser/Ala/Glu"

(ix) FEATURE:

 (A) NAME/KEY: Peptide
 (B) LOCATION: 5
 (D) OTHER INFORMATION: /product= "OTHER"
/note= "Xaa= Phe/Ile/Leu"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:2:

Xaa Xaa Xaa Leu Gly Xaa
1 5

(2) INFORMATION FOR SEQ ID NO:3:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 4 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(iii) HYPOTHETICAL: NO

(iv) ANTI-SENSE: NO

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:3:

Ser Leu Gly Ile
1

(2) INFORMATION FOR SEQ ID NO:4:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 3 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(ix) FEATURE:
 (A) NAME/KEY: Peptide
 (B) LOCATION: 1
 (D) OTHER INFORMATION: /product= "OTHER"
/note= "Xaa= Ser/Thr"

(ix) FEATURE:
 (A) NAME/KEY: Peptide
 (B) LOCATION: 3
 (D) OTHER INFORMATION: /product= "OTHER"
/note= "Xaa= Val/Ile/Leu"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:4:

Xaa Xaa Xaa
1

(2) INFORMATION FOR SEQ ID NO:5:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 15 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:5:

Asp Ser Glu Asn Ser Asn Phe Arg Asn Glu Ile Gln Ser Leu Val
1 5 10 15

(2) INFORMATION FOR SEQ ID NO:6:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 15 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:6:

Ser Ile Ser Asn Ser Arg Asn Glu Asn Glu Gly Gln Ser Leu Glu
1 5 10 15

(2) INFORMATION FOR SEQ ID NO:7:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 15 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:7:

Ser Thr Pro Asp Thr Gly Asn Glu Asn Glu Gly Gln Cys Leu Glu
1 5 10 15

(2) INFORMATION FOR SEQ ID NO:8:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 4 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:8:

Glu Ser Leu Val
1

(2) INFORMATION FOR SEQ ID NO:9:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 6 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:9:

Thr Ile Gln Ser Val Ile
1 5

(2) INFORMATION FOR SEQ ID NO:10:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 8 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:10:

Arg Gly Phe Ile Ser Ser Leu Val
1 5

(2) INFORMATION FOR SEQ ID NO:11:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 8 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:11:

Arg Glu Thr Ile Glu Ser Thr Val
1 5

(2) INFORMATION FOR SEQ ID NO:12:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 11 amino acids

- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:12:

| | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Asn | Phe | Arg | Thr | Tyr | Ile | Val | Ser | Phe | Val |
| 1 | | | | 5 | | | | | 10 | |

(2) INFORMATION FOR SEQ ID NO:13:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 13 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:13:

| | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Asp | Ser | Asn | Met | Asn | Met | Asn | Glu | Leu | Ser | Glu | Val |
| 1 | | | | 5 | | | | | 10 | | | |

(2) INFORMATION FOR SEQ ID NO:14:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 15 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:14:

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Pro | Thr | Cys | Ser | Gln | Ala | Asn | Ser | Gly | Arg | Ile | Ser | Thr | Leu |
| 1 | | | | 5 | | | | | 10 | | | | | 15 |

(2) INFORMATION FOR SEQ ID NO:15:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 15 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:15:

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Asp | Leu | Ala | Ser | Glu | Phe | Leu | Phe | Leu | Ser | Asn | Ser | Phe | Leu |
| 1 | | | | 5 | | | | | 10 | | | | | 15 |

(2) INFORMATION FOR SEQ ID NO:16:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 15 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS: single
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:16:

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asp | Ser | Glu | Met | Tyr | Asn | Phe | Arg | Ser | Gln | Leu | Ala | Ser | Val | Val |
| 1 | | | | 5 | | | | | 10 | | | | | 15 |

(2) INFORMATION FOR SEQ ID NO:17:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 15 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:17:

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Pro | Pro | Asp | Ser | Glu | Asp | Gly | Asn | Glu | Glu | Gln | Ser | Leu | Val |
| 1 | | | | 5 | | | | 10 | | | | | | 15 |

(2) INFORMATION FOR SEQ ID NO:18:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 4 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:18:

| | | | |
|-----|-----|-----|-----|
| Gln | Ser | Leu | Val |
| 1 | | | |

(2) INFORMATION FOR SEQ ID NO:19:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 5 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:19:

| | | | | |
|-----|-----|-----|-----|-----|
| Ile | Gln | Ser | Leu | Val |
| 1 | | | 5 | |

(2) INFORMATION FOR SEQ ID NO:20:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 6 amino acids

(B) TYPE: amino acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:20:

| | | | | | |
|-----|-----|-----|-----|-----|-----|
| Glu | Ile | Gln | Ser | Leu | Val |
|-----|-----|-----|-----|-----|-----|

5

(2) INFORMATION FOR SEQ ID NO:21:

- (ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:21:

Asn Glu Ile Gln Ser Leu Val
1 5

(2) INFORMATION FOR SEQ ID NO:22:

- (ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:22:

Arg Asn Glu Ile Gln Ser Leu Val
1 5

(2) INFORMATION FOR SEQ ID NO:23:

- (ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:23:

Asp Ser Glu Asn Ser Asn Phe Arg Asn Glu Ile Gln Ser Leu Val
1 5 10 15

(2) INFORMATION FOR SEQ ID NO:24:

- (ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:24:

Met Gly Ala Gly Ala Thr Gly Arg Ala Met Asp Gly Pro Arg Leu Leu
1 5 10 15

Leu Leu Leu Leu Leu Gly Val Ser Leu Gly Gly Ala Lys Glu Ala Cys
20 25 30

| | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
| Pro | Thr | Gly | Leu | Tyr | Thr | His | Ser | Gly | Glu | Cys | Cys | Lys | Ala | Cys | Asn | | |
| | | 35 | | | | | 40 | | | | | 45 | | | | | |
| Leu | Gly | Glu | Gly | Val | Ala | Gln | Pro | Cys | Gly | Ala | Asn | Gln | Thr | Val | Cys | | |
| | 50 | | | | | 55 | | | | | 60 | | | | | | |
| Glu | Pro | Cys | Leu | Asp | Ser | Val | Thr | Phe | Ser | Asp | Val | Val | Ser | Ala | Thr | | |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 | | |
| Glu | Pro | Cys | Lys | Pro | Cys | Thr | Glu | Cys | Val | Gly | Leu | Gln | Ser | Met | Ser | | |
| | | | | 85 | | | | | 90 | | | | | 95 | | | |
| Ala | Pro | Cys | Val | Glu | Ala | Asp | Asp | Ala | Val | Cys | Arg | Cys | Ala | Tyr | Gly | | |
| | | | 100 | | | | | 105 | | | | | 110 | | | | |
| Tyr | Tyr | Gln | Asp | Glu | Thr | Thr | Gly | Arg | Cys | Glu | Ala | Cys | Arg | Val | Cys | | |
| | | 115 | | | | | 120 | | | | | 125 | | | | | |
| Glu | Ala | Gly | Ser | Gly | Leu | Val | Phe | Ser | Cys | Gln | Asp | Lys | Gln | Asn | Thr | | |
| | 130 | | | | | 135 | | | | | 140 | | | | | | |
| Val | Cys | Glu | Glu | Cys | Pro | Asp | Gly | Thr | Tyr | Ser | Asp | Glu | Ala | Asn | His | | |
| 145 | | | | | 150 | | | | | 155 | | | | | 160 | | |
| Val | Asp | Pro | Cys | Leu | Pro | Cys | Thr | Val | Cys | Glu | Asp | Thr | Glu | Arg | Gln | | |
| | | | | 165 | | | | | 170 | | | | | 175 | | | |
| Leu | Arg | Glu | Cys | Thr | Arg | Trp | Ala | Asp | Ala | Glu | Cys | Glu | Glu | Ile | Pro | | |
| | | | 180 | | | | | 185 | | | | | 190 | | | | |
| Gly | Arg | Trp | Ile | Thr | Arg | Ser | Thr | Pro | Pro | Glu | Gly | Ser | Asp | Ser | Thr | | |
| | | 195 | | | | | 200 | | | | | 205 | | | | | |
| Ala | Pro | Ser | Thr | Gln | Glu | Pro | Glu | Ala | Pro | Pro | Glu | Gln | Asp | Leu | Ile | | |
| | 210 | | | | | 215 | | | | | 220 | | | | | | |
| Ala | Ser | Thr | Val | Ala | Gly | Val | Val | Thr | Thr | Val | Met | Gly | Ser | Ser | Gln | | |
| 225 | | | | | 230 | | | | | 235 | | | | | 240 | | |
| Pro | Val | Val | Thr | Arg | Gly | Thr | Thr | Asp | Asn | Leu | Ile | Pro | Val | Tyr | Cys | | |
| | | | | 245 | | | | | 250 | | | | | 255 | | | |
| Ser | Ile | Leu | Ala | Ala | Val | Val | Val | Gly | Leu | Val | Ala | Tyr | Ile | Ala | Phe | | |
| | | | 260 | | | | | 265 | | | | | 270 | | | | |
| Lys | Arg | Trp | Asn | Ser | Cys | Lys | Gln | Asn | Lys | Gly | Gly | Ala | Asn | Ser | Arg | | |
| | | 275 | | | | | 280 | | | | | 285 | | | | | |
| Pro | Val | Asn | Gln | Thr | Pro | Pro | Pro | Glu | Gly | Glu | Lys | Ile | His | Ser | Asp | | |
| | 290 | | | | | 295 | | | | | 300 | | | | | | |
| Ser | Gly | Ile | Ser | Val | Asp | Ser | Gln | Ser | Leu | His | Asp | Gln | Gln | Pro | His | | |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 | | |
| Thr | Gln | Thr | Ala | Ser | Gly | Gln | Ala | Leu | Lys | Gly | Asp | Gly | Gly | Leu | Tyr | | |
| | | | | 325 | | | | | 330 | | | | | 335 | | | |
| Ser | Ser | Leu | Pro | Pro | Ala | Lys | Arg | Glu | Glu | Val | Glu | Lys | Leu | Leu | Asn | | |
| | | | 340 | | | | | 345 | | | | | 350 | | | | |
| Gly | Ser | Ala | Gly | Asp | Thr | Trp | Arg | His | Leu | Ala | Gly | Glu | Leu | Gly | Tyr | | |
| | | 355 | | | | | 360 | | | | | 365 | | | | | |
| Gln | Pro | Glu | His | Ile | Asp | Ser | Phe | Thr | His | Glu | Ala | Cys | Pro | Val | Arg | | |
| | 370 | | | | | 375 | | | | | 380 | | | | | | |
| Ala | Leu | Leu | Ala | Ser | Trp | Ala | Thr | Gln | Asp | Ser | Ala | Thr | Leu | Asp | Ala | | |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 | | |

Leu Leu Ala Ala Leu Arg Arg Ile Gln Arg Ala Asp Leu Val Glu Ser
 405 410 415
 Leu Cys Ser Glu Ser Thr Ala Thr Ser Pro Val
 420 425

(2) INFORMATION FOR SEQ ID NO:25:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 458 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:25:

Met Asn Arg Gly Val Pro Phe Arg His Leu Leu Leu Val Leu Gln Leu
 1 5 10 15
 Ala Leu Leu Pro Ala Ala Thr Gln Gly Lys Lys Val Val Leu Gly Lys
 20 25 30
 Lys Gly Asp Thr Val Glu Leu Thr Cys Thr Ala Ser Gln Lys Lys Ser
 35 40 45
 Ile Gln Phe His Trp Lys Asn Ser Asn Gln Ile Lys Ile Leu Gly Asn
 50 55 60
 Gln Gly Ser Phe Leu Thr Lys Gly Pro Ser Lys Leu Asn Asp Arg Ala
 65 70 75 80
 Asp Ser Arg Arg Ser Leu Trp Asp Gln Gly Asn Phe Pro Leu Ile Ile
 85 90 95
 Lys Asn Leu Lys Ile Glu Asp Ser Asp Thr Tyr Ile Cys Glu Val Glu
 100 105 110
 Asp Gln Lys Glu Glu Val Gln Leu Leu Val Phe Gly Leu Thr Ala Asn
 115 120 125
 Ser Asp Thr His Leu Leu Gln Gly Gln Ser Leu Thr Ile Thr Leu Glu
 130 135 140
 Ser Pro Pro Gly Ser Ser Pro Ser Val Gln Cys Arg Ser Pro Arg Gly
 145 150 155 160
 Lys Asn Ile Gln Gly Gly Lys Thr Leu Ser Val Ser Gln Leu Glu Leu
 165 170 175
 Gln Asp Ser Gly Thr Trp Thr Cys Thr Val Leu Gln Asn Gln Lys Lys
 180 185 190
 Val Glu Phe Lys Ile Asp Ile Val Val Leu Ala Phe Gln Lys Ala Ser
 195 200 205
 Ser Ile Val Tyr Lys Lys Glu Gly Glu Gln Val Glu Phe Ser Phe Pro
 210 215 220
 Leu Ala Phe Thr Val Glu Lys Leu Thr Gly Ser Gly Glu Leu Trp Trp
 225 230 235 240
 Gln Ala Glu Arg Ala Ser Ser Ser Lys Ser Trp Ile Thr Phe Asp Leu
 245 250 255
 Lys Asn Lys Glu Val Ser Val Lys Arg Val Thr Gln Asp Pro Lys Leu

| 260 | | | | | | | | | | 265 | | | | | 270 | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|--|
| Gln | Met | Gly | Lys | Lys | Leu | Pro | Leu | His | Leu | Thr | Leu | Pro | Gln | Ala | Leu | | | | |
| | | 275 | | | | | 280 | | | | | 285 | | | | | | | |
| Pro | Gln | Tyr | Ala | Gly | Ser | Gly | Asn | Leu | Thr | Leu | Ala | Leu | Glu | Ala | Lys | | | | |
| | 290 | | | | | 295 | | | | | 300 | | | | | | | | |
| Thr | Gly | Lys | Leu | His | Gln | Glu | Asn | Val | Leu | Val | Val | Met | Arg | Ala | Thr | | | | |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 | | | | |
| Gln | Leu | Gln | Lys | Asn | Leu | Thr | Cys | Glu | Val | Trp | Gly | Pro | Thr | Ser | Pro | | | | |
| | | | | 325 | | | | | 330 | | | | | 335 | | | | | |
| Lys | Leu | Met | Leu | Ser | Leu | Lys | Leu | Glu | Asn | Lys | Glu | Ala | Lys | Val | Ser | | | | |
| | | 340 | | | | | | 345 | | | | | 350 | | | | | | |
| Lys | Arg | Glu | Lys | Ala | Val | Trp | Val | Leu | Asn | Pro | Glu | Ala | Gly | Met | Trp | | | | |
| | | 355 | | | | | 360 | | | | | 365 | | | | | | | |
| Gln | Cys | Leu | Leu | Ser | Asp | Ser | Gly | Gln | Val | Leu | Leu | Glu | Ser | Asn | Ile | | | | |
| | 370 | | | | | 375 | | | | | 380 | | | | | | | | |
| Lys | Val | Leu | Pro | Thr | Trp | Ser | Thr | Pro | Val | Gln | Pro | Met | Ala | Leu | Ile | | | | |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 | | | | |
| Val | Leu | Gly | Gly | Val | Ala | Gly | Leu | Leu | Leu | Phe | Ile | Gly | Leu | Gly | Ile | | | | |
| | | | | 405 | | | | | 410 | | | | | 415 | | | | | |
| Phe | Phe | Cys | Val | Arg | Cys | Arg | His | Arg | Arg | Arg | Gln | Ala | Glu | Arg | Met | | | | |
| | | | 420 | | | | | 425 | | | | | 430 | | | | | | |
| Ser | Gln | Ile | Lys | Arg | Leu | Leu | Ser | Glu | Lys | Lys | Glu | Cys | Gln | Cys | Pro | | | | |
| | | 435 | | | | | 440 | | | | | 445 | | | | | | | |
| His | Arg | Phe | Gln | Lys | Thr | Cys | Ser | Pro | Ile | | | | | | | | | | |
| | 450 | | | | | 455 | | | | | | | | | | | | | |

(2) INFORMATION FOR SEQ ID NO:26:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 828 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:26:

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|--|
| Met | Asn | Ser | Gly | Val | Ala | Met | Lys | Tyr | Gly | Asn | Asp | Ser | Ser | Ala | Glu | | | | |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | | | | | |
| Leu | Ser | Glu | Leu | His | Ser | Ala | Ala | Leu | Ala | Ser | Leu | Lys | Gly | Asp | Ile | | | | |
| | | | 20 | | | | | 25 | | | | | 30 | | | | | | |
| Val | Glu | Leu | Asn | Lys | Arg | Leu | Gln | Gln | Thr | Glu | Arg | Glu | Asp | Leu | Leu | | | | |
| | | 35 | | | | | 40 | | | | | 45 | | | | | | | |
| Glu | Lys | Lys | Leu | Ala | Lys | Ala | Gln | Cys | Glu | Gln | Ser | His | Leu | Met | Arg | | | | |
| | 50 | | | | | 55 | | | | | 60 | | | | | | | | |
| Glu | His | Glu | Asp | Val | Gln | Glu | Arg | Thr | Thr | Leu | Arg | Tyr | Glu | Glu | Arg | | | | |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 | | | | |
| Ile | Thr | Glu | Leu | His | Ser | Val | Ile | Ala | Glu | Leu | Asn | Lys | Lys | Ile | Asp | | | | |
| | | | | 85 | | | | | 90 | | | | | 95 | | | | | |

| | | | | | | | | | | | | | | | |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Arg | Leu | Gln | Gly 100 | Thr | Thr | Ile | Arg | Glu 105 | Glu | Asp | Glu | Tyr | Ser 110 | Glu | Leu |
| Arg | Ser | Glu 115 | Leu | Ser | Gln | Ser | Gln 120 | His | Glu | Val | Asn | Glu 125 | Asp | Ser | Arg |
| Ser | Met 130 | Asp | Gln | Asp | Gln | Thr 135 | Ser | Val | Ser | Ile | Pro 140 | Glu | Asn | Gln | Ser |
| Thr 145 | Met | Val | Thr | Ala | Asp 150 | Met | Asp | Asn | Cys | Ser 155 | Asp | Ile | Asn | Ser | Glu 160 |
| Leu | Gln | Arg | Val | Leu 165 | Thr | Gly | Leu | Glu | Asn 170 | Val | Val | Cys | Gly | Arg 175 | Lys |
| Lys | Ser | Ser | Cys 180 | Ser | Leu | Ser | Val | Ala 185 | Glu | Val | Asp | Arg | His 190 | Ile | Glu |
| Gln | Leu | Thr 195 | Thr | Ala | Ser | Glu | His 200 | Cys | Asp | Leu | Ala | Ile 205 | Lys | Thr | Val |
| Glu | Glu 210 | Ile | Glu | Gly | Val | Leu 215 | Gly | Arg | Asp | Leu | Tyr 220 | Pro | Asn | Leu | Ala |
| Glu 225 | Glu | Arg | Ser | Arg | Trp 230 | Glu | Lys | Glu | Leu | Ala 235 | Gly | Leu | Arg | Glu | Glu 240 |
| Asn | Glu | Ser | Leu | Thr 245 | Ala | Met | Leu | Cys | Ser 250 | Lys | Glu | Glu | Glu | Leu | Asn 255 |
| Arg | Thr | Lys | Ala 260 | Thr | Met | Asn | Ala | Ile 265 | Arg | Glu | Glu | Arg | Asp 270 | Arg | Leu |
| Arg | Arg | Arg 275 | Val | Arg | Glu | Leu | Gln 280 | Thr | Arg | Leu | Gln | Ser 285 | Val | Gln | Ala |
| Thr | Gly 290 | Pro | Ser | Ser | Pro | Gly 295 | Arg | Leu | Thr | Ser | Thr 300 | Asn | Arg | Pro | Ile |
| Asn 305 | Pro | Ser | Thr | Gly | Glu 310 | Leu | Ser | Thr | Ser | Ser 315 | Ser | Ser | Asn | Asp | Ile 320 |
| Pro | Ile | Ala | Lys | Ile 325 | Ala | Glu | Arg | Val | Lys 330 | Leu | Ser | Lys | Thr | Arg 335 | Ser |
| Glu | Ser | Ser | Ser 340 | Ser | Asp | Arg | Pro | Val 345 | Leu | Gly | Ser | Glu | Ile 350 | Ser | Ser |
| Ile | Gly 355 | Val | Ser | Ser | Ser | Val | Ala 360 | Glu | His | Leu | Ala | His 365 | Ser | Leu | Gln |
| Asp | Cys 370 | Ser | Asn | Ile | Gln | Glu 375 | Ile | Phe | Gln | Thr | Leu 380 | Tyr | Ser | His | Gly |
| Ser 385 | Ala | Ile | Ser | Glu | Ser 390 | Lys | Ile | Arg | Glu | Phe 395 | Glu | Val | Glu | Thr | Glu 400 |
| Arg | Leu | Asn | Ser | Arg 405 | Ile | Glu | His | Leu | Lys 410 | Ser | Gln | Asn | Asp | Leu 415 | Leu |
| Thr | Ile | Thr | Leu 420 | Glu | Glu | Cys | Lys | Ser 425 | Asn | Ala | Glu | Arg | Met 430 | Ser | Met |
| Leu | Val | Gly 435 | Lys | Tyr | Glu | Ser | Asn 440 | Ala | Thr | Ala | Leu | Arg 445 | Leu | Ala | Leu |
| Gln | Tyr 450 | Ser | Glu | Gln | Cys | Ile 455 | Glu | Ala | Tyr | Glu | Leu 460 | Leu | Leu | Ala | Leu |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Glu | Ser | Glu | Gln | Ser | Leu | Ile | Leu | Gly | Gln | Phe | Arg | Ala | Ala | Gly |
| 465 | | | | | 470 | | | | | 475 | | | | | 480 |
| Val | Gly | Ser | Ser | Pro | Gly | Asp | Gln | Ser | Gly | Asp | Glu | Asn | Ile | Thr | Gln |
| | | | | 485 | | | | | 490 | | | | | 495 | |
| Met | Leu | Lys | Arg | Ala | His | Asp | Cys | Arg | Lys | Thr | Ala | Glu | Asn | Ala | Ala |
| | | | 500 | | | | | 505 | | | | | 510 | | |
| Lys | Ala | Leu | Leu | Met | Lys | Leu | Asp | Gly | Ser | Cys | Gly | Gly | Ala | Phe | Ala |
| | | 515 | | | | | 520 | | | | | 525 | | | |
| Val | Ala | Gly | Cys | Ser | Val | Gln | Pro | Trp | Glu | Ser | Leu | Ser | Ser | Asn | Ser |
| | 530 | | | | | 535 | | | | | 540 | | | | |
| His | Thr | Ser | Thr | Thr | Ser | Ser | Thr | Ala | Ser | Ser | Cys | Asp | Thr | Glu | Phe |
| 545 | | | | | 550 | | | | | 555 | | | | | 560 |
| Thr | Lys | Glu | Asp | Glu | Gln | Arg | Leu | Lys | Asp | Tyr | Ile | Gln | Gln | Leu | Lys |
| | | | | 565 | | | | | 570 | | | | | 575 | |
| Asn | Asp | Arg | Ala | Ala | Val | Lys | Leu | Thr | Met | Leu | Glu | Leu | Glu | Ser | Ile |
| | | | 580 | | | | | 585 | | | | | 590 | | |
| His | Ile | Asp | Pro | Leu | Ser | Tyr | Asp | Val | Lys | Pro | Arg | Gly | Asp | Ser | Gln |
| | | 595 | | | | | 600 | | | | | 605 | | | |
| Arg | Leu | Asp | Leu | Glu | Asn | Ala | Val | Leu | Met | Gln | Glu | Leu | Met | Ala | Met |
| | 610 | | | | | 615 | | | | | 620 | | | | |
| Lys | Glu | Glu | Met | Ala | Glu | Leu | Lys | Ala | Gln | Leu | Tyr | Leu | Leu | Glu | Lys |
| 625 | | | | | 630 | | | | | 635 | | | | | 640 |
| Glu | Lys | Lys | Ala | Leu | Glu | Leu | Lys | Leu | Ser | Thr | Arg | Glu | Ala | Gln | Glu |
| | | | | 645 | | | | | 650 | | | | | 655 | |
| Gln | Ala | Tyr | Leu | Val | His | Ile | Glu | His | Leu | Lys | Ser | Glu | Val | Glu | Glu |
| | | | 660 | | | | | 665 | | | | | 670 | | |
| Gln | Lys | Glu | Gln | Arg | Met | Arg | Ser | Leu | Ser | Ser | Thr | Ser | Ser | Gly | Ser |
| | | 675 | | | | | 680 | | | | | 685 | | | |
| Lys | Asp | Lys | Pro | Gly | Lys | Glu | Cys | Ala | Asp | Ala | Ala | Ser | Pro | Ala | Leu |
| | 690 | | | | | 695 | | | | | 700 | | | | |
| Ser | Leu | Ala | Glu | Leu | Arg | Thr | Thr | Cys | Ser | Glu | Asn | Glu | Leu | Ala | Ala |
| 705 | | | | | 710 | | | | | 715 | | | | | 720 |
| Glu | Phe | Thr | Asn | Ala | Ile | Arg | Arg | Glu | Lys | Lys | Leu | Lys | Ala | Arg | Val |
| | | | 725 | | | | | | 730 | | | | | 735 | |
| Gln | Glu | Leu | Val | Ser | Ala | Leu | Glu | Arg | Leu | Thr | Lys | Ser | Ser | Glu | Ile |
| | | | 740 | | | | | 745 | | | | | 750 | | |
| Arg | His | Gln | Gln | Ser | Ala | Glu | Phe | Val | Asn | Asp | Leu | Lys | Arg | Ala | Asn |
| | | 755 | | | | | 760 | | | | | 765 | | | |
| Ser | Asn | Leu | Val | Ala | Ala | Tyr | Glu | Lys | Ala | Lys | Lys | Lys | His | Gln | Asn |
| | 770 | | | | | 775 | | | | | 780 | | | | |
| Lys | Leu | Lys | Lys | Leu | Glu | Ser | Gln | Met | Met | Ala | Met | Val | Glu | Arg | His |
| 785 | | | | | 790 | | | | | 795 | | | | | 800 |
| Glu | Thr | Gln | Val | Arg | Met | Leu | Lys | Gln | Arg | Ile | Ala | Leu | Leu | Glu | Glu |
| | | | | 805 | | | | | 810 | | | | | 815 | |
| Glu | Asn | Ser | Arg | Pro | His | Thr | Asn | Glu | Thr | Ser | Leu | | | | |
| | | | 820 | | | | | 825 | | | | | | | |

(2) INFORMATION FOR SEQ ID NO:27:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 672 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:27:

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| Met | Ala | Asp | Val | Phe | Pro | Gly | Asn | Asp | Ser | Thr | Ala | Ser | Gln | Asp | Val | 1 | 5 | 10 | 15 |
| Ala | Asn | Arg | Phe | Ala | Arg | Lys | Gly | Ala | Leu | Arg | Gln | Lys | Asn | Val | His | 20 | 25 | 30 | |
| Glu | Val | Lys | Asp | His | Lys | Phe | Ile | Ala | Arg | Phe | Phe | Lys | Gln | Pro | Thr | 35 | 40 | 45 | |
| Phe | Cys | Ser | His | Cys | Thr | Asp | Phe | Ile | Trp | Gly | Phe | Gly | Lys | Gly | Gly | 50 | 55 | 60 | |
| Phe | Gln | Cys | Gln | Val | Cys | Cys | Phe | Val | Val | His | Lys | Arg | Cys | His | Glu | 65 | 70 | 75 | |
| Phe | Val | Thr | Phe | Ser | Cys | Pro | Gly | Ala | Asp | Lys | Gly | Pro | Asp | Thr | Asp | 85 | 90 | 95 | |
| Asp | Pro | Arg | Ser | Lys | His | Lys | Phe | Lys | Ile | His | Thr | Tyr | Gly | Ser | Pro | 100 | 105 | 110 | |
| Thr | Phe | Cys | Asp | His | Cys | Gly | Ser | Leu | Leu | Tyr | Gly | Leu | Ile | His | Gln | 115 | 120 | 125 | |
| Gly | Met | Lys | Cys | Asp | Thr | Cys | Asp | Met | Asn | Val | His | Lys | Gln | Cys | Val | 130 | 135 | 140 | |
| Ile | Asn | Val | Pro | Ser | Leu | Cys | Gly | Met | Asp | His | Thr | Glu | Lys | Arg | Gly | 145 | 150 | 155 | |
| Arg | Ile | Tyr | Leu | Lys | Ala | Glu | Val | Ala | Asp | Glu | Lys | Leu | His | Val | Thr | 165 | 170 | 175 | |
| Val | Arg | Asp | Ala | Lys | Asn | Leu | Ile | Pro | Met | Asp | Pro | Asn | Gly | Leu | Ser | 180 | 185 | 190 | |
| Asp | Pro | Tyr | Val | Lys | Leu | Lys | Leu | Ile | Pro | Asp | Pro | Lys | Asn | Glu | Ser | 195 | 200 | 205 | |
| Lys | Gln | Lys | Thr | Lys | Thr | Ile | Arg | Ser | Thr | Leu | Asn | Pro | Gln | Trp | Asn | 210 | 215 | 220 | |
| Glu | Ser | Phe | Thr | Phe | Lys | Leu | Lys | Pro | Ser | Asp | Lys | Asp | Arg | Arg | Leu | 225 | 230 | 235 | |
| Ser | Val | Glu | Ile | Trp | Asp | Trp | Asp | Arg | Thr | Thr | Arg | Asn | Asp | Phe | Met | 245 | 250 | 255 | |
| Gly | Ser | Leu | Ser | Phe | Gly | Val | Ser | Glu | Leu | Met | Lys | Met | Pro | Ala | Ser | 260 | 265 | 270 | |
| Gly | Trp | Tyr | Lys | Leu | Leu | Asn | Gln | Glu | Glu | Gly | Glu | Tyr | Tyr | Asn | Val | 275 | 280 | 285 | |
| Pro | Ile | Pro | Glu | Gly | Asp | Glu | Glu | Gly | Asn | Met | Glu | Leu | Arg | Gln | Lys | | | | |

| 290 | | | | | 295 | | | | | 300 | | | | | |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Phe 305 | Glu | Lys | Ala | Lys | Leu 310 | Gly | Pro | Ala | Gly | Asn 315 | Lys | Val | Ile | Ser | Pro 320 |
| Ser | Glu | Asp | Arg | Lys 325 | Gln | Pro | Ser | Asn | Asn 330 | Leu | Asp | Arg | Val | Lys 335 | Leu |
| Thr | Asp | Phe | Asn 340 | Phe | Leu | Met | Val | Leu 345 | Gly | Lys | Gly | Ser | Phe 350 | Gly | Lys |
| Val | Met | Leu 355 | Ala | Asp | Arg | Lys | Gly 360 | Thr | Glu | Glu | Leu | Tyr 365 | Ala | Ile | Lys |
| Ile | Leu 370 | Lys | Lys | Asp | Val | Val 375 | Ile | Gln | Asp | Asp 380 | Asp | Val | Glu | Cys | Thr |
| Met 385 | Val | Glu | Lys | Arg | Val 390 | Leu | Ala | Leu | Leu | Asp 395 | Lys | Pro | Pro | Phe | Leu 400 |
| Thr | Gln | Leu | His | Ser 405 | Cys | Phe | Gln | Thr | Val 410 | Asp | Arg | Leu | Tyr | Phe 415 | Val |
| Met | Glu | Tyr | Val 420 | Asn | Gly | Gly | Asp | Leu 425 | Met | Tyr | His | Ile | Gln 430 | Gln | Val |
| Gly | Lys | Phe 435 | Lys | Glu | Pro | Gln | Ala 440 | Val | Phe | Tyr | Ala | Ala 445 | Glu | Ile | Ser |
| Ile | Gly 450 | Leu | Phe | Phe | Leu | His 455 | Lys | Arg | Gly | Ile | Ile 460 | Tyr | Arg | Asp | Leu |
| Lys 465 | Leu | Asp | Asn | Val | Met 470 | Leu | Asp | Ser | Glu | Gly 475 | His | Ile | Lys | Ile | Ala 480 |
| Asp | Phe | Gly | Met | Cys 485 | Lys | Glu | His | Met | Met 490 | Asp | Gly | Val | Thr | Thr 495 | Arg |
| Thr | Phe | Cys | Gly 500 | Thr | Pro | Asp | Tyr | Ile 505 | Ala | Pro | Glu | Ile | Ile 510 | Ala | Tyr |
| Gln | Pro | Tyr 515 | Gly | Lys | Ser | Val | Asp 520 | Trp | Trp | Ala | Tyr | Gly 525 | Val | Leu | Leu |
| Tyr 530 | Glu | Met | Leu | Ala | Gly | Gln 535 | Pro | Pro | Phe | Asp | Gly 540 | Glu | Asp | Glu | Asp |
| Glu 545 | Leu | Phe | Gln | Ser | Ile 550 | Met | Glu | His | Asn | Val 555 | Ser | Tyr | Pro | Lys | Ser 560 |
| Leu | Ser | Lys | Glu | Ala 565 | Val | Ser | Ile | Cys | Lys 570 | Gly | Leu | Met | Thr | Lys 575 | His |
| Pro | Ala | Lys | Arg 580 | Leu | Gly | Cys | Gly | Pro 585 | Glu | Gly | Glu | Arg | Asp 590 | Val | Arg |
| Glu | His 595 | Ala | Phe | Phe | Arg | Arg | Ile 600 | Asp | Trp | Glu | Lys | Leu 605 | Glu | Asn | Arg |
| Glu 610 | Ile | Gln | Pro | Pro | Phe | Lys 615 | Pro | Lys | Val | Cys | Gly 620 | Lys | Gly | Ala | Glu |
| Asn 625 | Phe | Asp | Lys | Phe | Phe 630 | Thr | Arg | Gly | Gln | Pro 635 | Val | Leu | Thr | Pro | Pro 640 |
| Asp | Gln | Leu | Val | Ile 645 | Ala | Asn | Ile | Asp | Gln 650 | Ser | Asp | Phe | Glu | Gly 655 | Phe |

Ser Tyr Val Asn Pro Gln Phe Val His Pro Ile Leu Gln Ser Ala Val
660 665 670

(2) INFORMATION FOR SEQ ID NO:28:

- (i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 471 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS: single
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:28:

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Asp | Ile | Leu | Cys | Glu | Glu | Asn | Thr | Ser | Leu | Ser | Ser | Thr | Thr | Asn | 1 | 5 | 10 | 15 |
| Ser | Leu | Met | Gln | Leu | Asn | Asp | Asp | Thr | Arg | Leu | Tyr | Ser | Asn | Asp | Phe | 20 | 25 | 30 | |
| Asn | Ser | Gly | Glu | Ala | Asn | Thr | Ser | Asp | Ala | Phe | Asn | Trp | Thr | Val | Asp | 35 | 40 | 45 | |
| Ser | Glu | Asn | Arg | Thr | Asn | Leu | Ser | Cys | Glu | Gly | Cys | Leu | Ser | Pro | Ser | 50 | 55 | 60 | |
| Cys | Leu | Ser | Leu | Leu | His | Leu | Gln | Glu | Lys | Asn | Trp | Ser | Ala | Leu | Leu | 65 | 70 | 75 | 80 |
| Thr | Ala | Val | Val | Ile | Ile | Leu | Thr | Ile | Ala | Gly | Asn | Ile | Leu | Val | Ile | 85 | 90 | 95 | |
| Met | Ala | Val | Ser | Leu | Glu | Lys | Lys | Leu | Gln | Asn | Ala | Thr | Asn | Tyr | Phe | 100 | 105 | 110 | |
| Leu | Met | Ser | Leu | Ala | Ile | Ala | Asp | Met | Leu | Leu | Gly | Phe | Leu | Val | Met | 115 | 120 | 125 | |
| Pro | Val | Ser | Met | Leu | Thr | Ile | Leu | Tyr | Gly | Tyr | Arg | Trp | Pro | Leu | Pro | 130 | 135 | 140 | |
| Ser | Lys | Leu | Cys | Ala | Val | Trp | Ile | Tyr | Leu | Asp | Val | Leu | Phe | Ser | Thr | 145 | 150 | 155 | 160 |
| Ala | Ser | Ile | Met | His | Leu | Cys | Ala | Ile | Ser | Leu | Asp | Arg | Tyr | Val | Ala | 165 | 170 | 175 | |
| Ile | Gln | Asn | Pro | Ile | His | His | Ser | Arg | Phe | Asn | Ser | Arg | Thr | Lys | Ala | 180 | 185 | 190 | |
| Phe | Leu | Lys | Ile | Ile | Ala | Val | Trp | Thr | Ile | Ser | Val | Gly | Ile | Ser | Met | 195 | 200 | 205 | |
| Pro | Ile | Pro | Val | Phe | Gly | Leu | Gln | Asp | Asp | Ser | Lys | Val | Phe | Lys | Glu | 210 | 215 | 220 | |
| Gly | Ser | Cys | Leu | Leu | Ala | Asp | Asp | Asn | Phe | Val | Leu | Ile | Gly | Ser | Phe | 225 | 230 | 235 | 240 |
| Val | Ser | Phe | Phe | Ile | Pro | Leu | Thr | Ile | Met | Val | Ile | Thr | Tyr | Phe | Leu | 245 | 250 | 255 | |
| Thr | Ile | Lys | Ser | Leu | Gln | Lys | Glu | Ala | Thr | Leu | Cys | Val | Ser | Asp | Leu | 260 | 265 | 270 | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Gly | Thr | Arg | Ala | Lys | Leu | Ala | Ser | Phe | Ser | Phe | Leu | Pro | Gln | Ser | Ser | |
| | | 275 | | | | | 280 | | | | | 285 | | | | |
| Leu | Ser | Ser | Glu | Lys | Leu | Phe | Gln | Arg | Ser | Ile | His | Arg | Glu | Pro | Gly | |
| | 290 | | | | | 295 | | | | | 300 | | | | | |
| Ser | Tyr | Thr | Gly | Arg | Arg | Thr | Met | Gln | Ser | Ile | Ser | Asn | Glu | Gln | Lys | |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 | |
| Ala | Cys | Lys | Val | Leu | Gly | Ile | Val | Phe | Phe | Leu | Phe | Val | Val | Met | Trp | |
| | | | | 325 | | | | | 330 | | | | | 335 | | |
| Cys | Pro | Phe | Phe | Ile | Thr | Asn | Ile | Met | Ala | Val | Ile | Cys | Lys | Glu | Ser | |
| | | | 340 | | | | | 345 | | | | | 350 | | | |
| Cys | Asn | Glu | Asp | Val | Ile | Gly | Ala | Leu | Leu | Asn | Val | Phe | Val | Trp | Ile | |
| | | 355 | | | | | 360 | | | | | 365 | | | | |
| Gly | Tyr | Leu | Ser | Ser | Ala | Val | Asn | Pro | Leu | Val | Tyr | Thr | Leu | Phe | Asn | |
| | 370 | | | | | 375 | | | | | 380 | | | | | |
| Lys | Thr | Tyr | Arg | Ser | Ala | Phe | Ser | Arg | Tyr | Ile | Gln | Cys | Gln | Tyr | Lys | |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 | |
| Glu | Asn | Lys | Lys | Pro | Leu | Gln | Leu | Ile | Leu | Val | Asn | Thr | Ile | Pro | Ala | |
| | | | | 405 | | | | | 410 | | | | | 415 | | |
| Leu | Ala | Tyr | Lys | Ser | Ser | Gln | Leu | Gln | Met | Gly | Gln | Lys | Lys | Asn | Ser | |
| | | | 420 | | | | | 425 | | | | | 430 | | | |
| Lys | Gln | Asp | Ala | Lys | Thr | Thr | Asp | Asn | Asp | Cys | Ser | Met | Val | Ala | Leu | |
| | | 435 | | | | | 440 | | | | | 445 | | | | |
| Gly | Lys | Gln | His | Ser | Glu | Glu | Ala | Ser | Lys | Asp | Asn | Ser | Asp | Gly | Val | |
| | 450 | | | | | 455 | | | | | 460 | | | | | |
| Asn | Glu | Lys | Val | Ser | Cys | Val | | | | | | | | | | |
| 465 | | | | | 470 | | | | | | | | | | | |

(2) INFORMATION FOR SEQ ID NO:29:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 481 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:29:

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Met | Ala | Leu | Ser | Tyr | Arg | Val | Ser | Glu | Leu | Gln | Ser | Thr | Ile | Pro | Glu | |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | | |
| His | Ile | Leu | Gln | Ser | Thr | Phe | Val | His | Val | Ile | Ser | Ser | Asn | Trp | Ser | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |
| Gly | Leu | Gln | Thr | Glu | Ser | Ile | Pro | Glu | Glu | Met | Lys | Gln | Ile | Val | Glu | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| Glu | Gln | Gly | Asn | Lys | Leu | His | Trp | Ala | Ala | Leu | Leu | Ile | Leu | Met | Val | |
| | | 50 | | | | 55 | | | | | 60 | | | | | |
| Ile | Ile | Pro | Thr | Ile | Gly | Gly | Asn | Thr | Leu | Val | Ile | Leu | Ala | Val | Ser | |
| 65 | | | | | 70 | | | | 75 | | | | | 80 | | |
| Leu | Glu | Lys | Lys | Leu | Gln | Tyr | Ala | Thr | Asn | Tyr | Phe | Leu | Met | Ser | Leu | |

| | | | | | | | | | | | | | | | |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| | | | | 85 | | | | 90 | | | | 95 | | | |
| Ala | Val | Ala | Asp 100 | Leu | Leu | Val | Gly | Leu 105 | Phe | Val | Met | Pro | Ile 110 | Ala | Leu |
| Leu | Thr | Ile 115 | Met | Phe | Glu | Ala | Met 120 | Trp | Pro | Leu | Pro | Leu 125 | Val | Leu | Cys |
| Pro | Ala 130 | Trp | Leu | Phe | Leu | Asp 135 | Val | Leu | Phe | Ser | Thr 140 | Ala | Ser | Ile | Met |
| His 145 | Leu | Cys | Ala | Ile | Ser 150 | Val | Asp | Arg | Tyr | Ile 155 | Ala | Ile | Lys | Lys | Pro 160 |
| Ile | Gln | Ala | Asn | Gln 165 | Tyr | Asn | Ser | Arg | Ala 170 | Thr | Ala | Phe | Ile | Lys 175 | Ile |
| Thr | Val | Val | Trp 180 | Leu | Ile | Ser | Ile | Gly 185 | Ile | Ala | Ile | Pro | Val 190 | Pro | Ile |
| Lys | Gly | Ile 195 | Glu | Thr | Asp | Val | Asp 200 | Asn | Pro | Asn | Asn | Ile 205 | Thr | Cys | Val |
| Leu | Thr 210 | Lys | Glu | Arg | Phe | Gly 215 | Asp | Phe | Met | Leu | Phe 220 | Gly | Ser | Leu | Ala |
| Ala 225 | Phe | Phe | Thr | Pro | Leu 230 | Ala | Ile | Met | Ile | Val 235 | Thr | Tyr | Phe | Leu | Thr 240 |
| Ile | His | Ala | Leu | Gln 245 | Lys | Lys | Ala | Tyr | Leu 250 | Val | Lys | Asn | Lys | Pro 255 | Pro |
| Gln | Arg | Leu | Thr 260 | Trp | Leu | Thr | Val | Ser 265 | Thr | Val | Phe | Gln | Arg 270 | Asp | Glu |
| Thr | Pro | Cys 275 | Ser | Ser | Pro | Glu | Lys 280 | Val | Ala | Met | Leu | Asp 285 | Gly | Ser | Arg |
| Lys | Asp 290 | Lys | Ala | Leu | Pro | Asn 295 | Ser | Gly | Asp | Glu | Thr 300 | Leu | Met | Arg | Arg |
| Thr 305 | Ser | Thr | Ile | Gly | Lys 310 | Lys | Ser | Val | Gln | Thr 315 | Ile | Ser | Asn | Glu | Gln 320 |
| Arg | Ala | Ser | Lys | Val 325 | Leu | Gly | Ile | Val | Phe 330 | Phe | Leu | Phe | Leu | Leu 335 | Met |
| Trp | Cys | Pro | Phe 340 | Phe | Ile | Thr | Asn 345 | Ile | Thr | Leu | Val | Leu | Cys 350 | Asp | Ser |
| Cys | Asn | Gln 355 | Thr | Thr | Leu | Gln | Met 360 | Leu | Leu | Glu | Ile | Phe 365 | Val | Trp | Ile |
| Gly | Tyr 370 | Val | Ser | Ser | Gly | Val 375 | Asn | Pro | Leu | Val | Tyr 380 | Thr | Leu | Phe | Asn |
| Lys 385 | Thr | Phe | Arg | Asp | Ala 390 | Phe | Gly | Arg | Tyr | Ile 395 | Thr | Cys | Asn | Tyr | Arg 400 |
| Ala | Thr | Lys | Ser | Val 405 | Lys | Thr | Leu | Arg | Lys 410 | Arg | Ser | Ser | Lys | Ile 415 | Tyr |
| Phe | Arg | Asn | Pro 420 | Met | Ala | Glu | Asn | Ser 425 | Lys | Phe | Phe | Lys | Lys 430 | His | Gly |
| Ile | Arg | Asn 435 | Gly | Ile | Asn | Pro | Ala 440 | Met | Tyr | Gln | Ser | Pro 445 | Met | Arg | Leu |

Arg Ser Ser Thr Ile Gln Ser Ser Ser Ile Ile Leu Leu Asp Thr Leu
 450 455 460
 Leu Leu Thr Glu Asn Glu Gly Asp Lys Thr Glu Glu Gln Val Ser Val
 465 470 475 480
 Val

(2) INFORMATION FOR SEQ ID NO:30:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 2843 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: peptide

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:30:

Met Ala Ala Ala Ser Tyr Asp Gln Leu Leu Lys Gln Val Glu Ala Leu
 1 5 10 15
 Lys Met Glu Asn Ser Asn Leu Arg Gln Glu Leu Glu Asp Asn Ser Asn
 20 25 30
 His Leu Thr Lys Leu Glu Thr Glu Ala Ser Asn Met Lys Glu Val Leu
 35 40 45
 Lys Gln Leu Gln Gly Ser Ile Glu Asp Glu Ala Met Ala Ser Ser Gly
 50 55 60
 Gln Ile Asp Leu Leu Glu Arg Leu Lys Glu Leu Asn Leu Asp Ser Ser
 65 70 75 80
 Asn Phe Pro Gly Val Lys Leu Arg Ser Lys Met Ser Leu Arg Ser Tyr
 85 90 95
 Gly Ser Arg Glu Gly Ser Val Ser Ser Arg Ser Gly Glu Cys Ser Pro
 100 105 110
 Val Pro Met Gly Ser Phe Pro Arg Arg Gly Phe Val Asn Gly Ser Arg
 115 120 125
 Glu Ser Thr Gly Tyr Leu Glu Glu Leu Glu Lys Glu Arg Ser Leu Leu
 130 135 140
 Leu Ala Asp Leu Asp Lys Glu Glu Lys Glu Lys Asp Trp Tyr Tyr Ala
 145 150 155 160
 Gln Leu Gln Asn Leu Thr Lys Arg Ile Asp Ser Leu Pro Leu Thr Glu
 165 170 175
 Asn Phe Ser Leu Gln Thr Asp Met Thr Arg Arg Gln Leu Glu Tyr Glu
 180 185 190
 Ala Arg Gln Ile Arg Val Ala Met Glu Glu Gln Leu Gly Thr Cys Gln
 195 200 205
 Asp Met Glu Lys Arg Ala Gln Arg Arg Ile Ala Arg Ile Gln Gln Ile
 210 215 220
 Glu Lys Asp Ile Leu Arg Ile Arg Gln Leu Leu Gln Ser Gln Ala Thr
 225 230 235 240
 Glu Ala Glu Arg Ser Ser Gln Asn Lys His Glu Thr Gly Ser His Asp
 245 250 255

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Ala | Glu | Arg | Gln | Asn | Glu | Gly | Gln | Gly | Val | Gly | Glu | Ile | Asn | Met | Ala | |
| | | | 260 | | | | | 265 | | | | | 270 | | | |
| Thr | Ser | Gly | Asn | Gly | Gln | Gly | Ser | Thr | Thr | Arg | Met | Asp | His | Glu | Thr | |
| | | 275 | | | | | 280 | | | | | 285 | | | | |
| Ala | Ser | Val | Leu | Ser | Ser | Ser | Ser | Thr | His | Ser | Ala | Pro | Arg | Arg | Leu | |
| | 290 | | | | | 295 | | | | | 300 | | | | | |
| Thr | Ser | His | Leu | Gly | Thr | Lys | Val | Glu | Met | Val | Tyr | Ser | Leu | Leu | Ser | |
| 305 | | | | | 310 | | | | | 315 | | | | | 320 | |
| Met | Leu | Gly | Thr | His | Asp | Lys | Asp | Asp | Met | Ser | Arg | Thr | Leu | Leu | Ala | |
| | | | | 325 | | | | | 330 | | | | | | 335 | |
| Met | Ser | Ser | Ser | Gln | Asp | Ser | Cys | Ile | Ser | Met | Arg | Gln | Ser | Gly | Cys | |
| | | | 340 | | | | | 345 | | | | | 350 | | | |
| Leu | Pro | Leu | Leu | Ile | Gln | Leu | Leu | His | Gly | Asn | Asp | Lys | Asp | Ser | Val | |
| | | 355 | | | | | 360 | | | | | 365 | | | | |
| Leu | Leu | Gly | Asn | Ser | Arg | Gly | Ser | Lys | Glu | Ala | Arg | Ala | Arg | Ala | Ser | |
| | 370 | | | | | 375 | | | | | 380 | | | | | |
| Ala | Ala | Leu | His | Asn | Ile | Ile | His | Ser | Gln | Pro | Asp | Asp | Lys | Arg | Gly | |
| 385 | | | | | 390 | | | | | 395 | | | | | 400 | |
| Arg | Arg | Glu | Ile | Arg | Val | Leu | His | Leu | Leu | Glu | Gln | Ile | Arg | Ala | Tyr | |
| | | | | 405 | | | | | 410 | | | | | 415 | | |
| Cys | Ser | Thr | Cys | Trp | Glu | Trp | Gln | Glu | Ala | His | Glu | Pro | Gly | Met | Asp | |
| | | | 420 | | | | | 425 | | | | | 430 | | | |
| Gln | Asp | Lys | Asn | Pro | Met | Pro | Ala | Pro | Val | Glu | His | Gln | Ile | Cys | Pro | |
| | 435 | | | | | | 440 | | | | | 445 | | | | |
| Ala | Val | Cys | Val | Leu | Met | Lys | Leu | Ser | Phe | Asp | Glu | Glu | His | Arg | His | |
| | 450 | | | | | 455 | | | | | 460 | | | | | |
| Ala | Met | Asn | Glu | Leu | Gly | Gly | Leu | Gln | Ala | Ile | Ala | Glu | Leu | Leu | Gln | |
| 465 | | | | | 470 | | | | | 475 | | | | | 480 | |
| Val | Asp | Cys | Glu | Met | Tyr | Gly | Leu | Thr | Asn | Asp | His | Tyr | Ser | Ile | Thr | |
| | | | | 485 | | | | | 490 | | | | | 495 | | |
| Leu | Arg | Arg | Tyr | Ala | Gly | Met | Ala | Leu | Thr | Asn | Leu | Thr | Phe | Gly | Asp | |
| | | | 500 | | | | 505 | | | | | | 510 | | | |
| Val | Ala | Asn | Lys | Ala | Thr | Leu | Cys | Ser | Met | Lys | Gly | Cys | Met | Arg | Ala | |
| | | 515 | | | | | 520 | | | | | 525 | | | | |
| Leu | Val | Ala | Gln | Leu | Lys | Ser | Glu | Ser | Glu | Asp | Leu | Gln | Gln | Val | Ile | |
| | 530 | | | | | 535 | | | | | 540 | | | | | |
| Ala | Ser | Val | Leu | Arg | Asn | Leu | Ser | Trp | Arg | Ala | Asp | Val | Asn | Ser | Lys | |
| 545 | | | | | 550 | | | | | 555 | | | | | 560 | |
| Lys | Thr | Leu | Arg | Glu | Val | Gly | Ser | Val | Lys | Ala | Leu | Met | Glu | Cys | Ala | |
| | | | | 565 | | | | | 570 | | | | | 575 | | |
| Leu | Glu | Val | Lys | Lys | Glu | Ser | Thr | Leu | Lys | Ser | Val | Leu | Ser | Ala | Leu | |
| | | | 580 | | | | 585 | | | | | 590 | | | | |
| Trp | Asn | Leu | Ser | Ala | His | Cys | Thr | Glu | Asn | Lys | Ala | Asp | Ile | Cys | Ala | |
| | | 595 | | | | | 600 | | | | | 605 | | | | |
| Val | Asp | Gly | Ala | Leu | Ala | Phe | Leu | Val | Gly | Thr | Leu | Thr | Tyr | Arg | Ser | |
| | 610 | | | | | 615 | | | | | 620 | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Thr | Asn | Thr | Leu | Ala | Ile | Ile | Glu | Ser | Gly | Gly | Gly | Ile | Leu | Arg | 625 | 630 | 635 | 640 |
| Asn | Val | Ser | Ser | Leu | Ile | Ala | Thr | Asn | Glu | Asp | His | Arg | Gln | Ile | Leu | 645 | 650 | 655 | |
| Arg | Glu | Asn | Asn | Cys | Leu | Gln | Thr | Leu | Leu | Gln | His | Leu | Lys | Ser | His | 660 | 665 | 670 | |
| Ser | Leu | Thr | Ile | Val | Ser | Asn | Ala | Cys | Gly | Thr | Leu | Trp | Asn | Leu | Ser | 675 | 680 | 685 | |
| Ala | Arg | Asn | Pro | Lys | Asp | Gln | Glu | Ala | Leu | Trp | Asp | Met | Gly | Ala | Val | 690 | 695 | 700 | |
| Ser | Met | Leu | Lys | Asn | Leu | Ile | His | Ser | Lys | His | Lys | Met | Ile | Ala | Met | 705 | 710 | 715 | 720 |
| Gly | Ser | Ala | Ala | Ala | Leu | Arg | Asn | Leu | Met | Ala | Asn | Arg | Pro | Ala | Lys | 725 | 730 | 735 | |
| Tyr | Lys | Asp | Ala | Asn | Ile | Met | Ser | Pro | Gly | Ser | Ser | Leu | Pro | Ser | Leu | 740 | 745 | 750 | |
| His | Val | Arg | Lys | Gln | Lys | Ala | Leu | Glu | Ala | Glu | Leu | Asp | Ala | Gln | His | 755 | 760 | 765 | |
| Leu | Ser | Glu | Thr | Phe | Asp | Asn | Ile | Asp | Asn | Ile | Ser | Pro | Lys | Ala | Ser | 770 | 775 | 780 | |
| His | Arg | Ser | Lys | Gln | Arg | His | Lys | Gln | Ser | Leu | Tyr | Gly | Asp | Tyr | Val | 785 | 790 | 795 | 800 |
| Phe | Asp | Thr | Asn | Arg | His | Asp | Asp | Asn | Arg | Ser | Asp | Asn | Phe | Asn | Thr | 805 | 810 | 815 | |
| Gly | Asn | Met | Thr | Val | Leu | Ser | Pro | Tyr | Leu | Asn | Thr | Thr | Val | Leu | Pro | 820 | 825 | 830 | |
| Ser | Ser | Ser | Ser | Ser | Arg | Gly | Ser | Leu | Asp | Ser | Ser | Arg | Ser | Glu | Lys | 835 | 840 | 845 | |
| Asp | Arg | Ser | Leu | Glu | Arg | Glu | Arg | Gly | Ile | Gly | Leu | Gly | Asn | Tyr | His | 850 | 855 | 860 | |
| Pro | Ala | Thr | Glu | Asn | Pro | Gly | Thr | Ser | Ser | Lys | Arg | Gly | Leu | Gln | Ile | 865 | 870 | 875 | 880 |
| Ser | Thr | Thr | Ala | Ala | Gln | Ile | Ala | Lys | Val | Met | Glu | Glu | Val | Ser | Ala | 885 | 890 | 895 | |
| Ile | His | Thr | Ser | Gln | Glu | Asp | Arg | Ser | Ser | Gly | Ser | Thr | Thr | Glu | Leu | 900 | 905 | 910 | |
| His | Cys | Val | Thr | Asp | Glu | Arg | Asn | Ala | Leu | Arg | Arg | Ser | Ser | Ala | Ala | 915 | 920 | 925 | |
| His | Thr | His | Ser | Asn | Thr | Tyr | Asn | Phe | Thr | Lys | Ser | Glu | Asn | Ser | Asn | 930 | 935 | 940 | |
| Arg | Thr | Cys | Ser | Met | Pro | Tyr | Ala | Lys | Leu | Glu | Tyr | Lys | Arg | Ser | Ser | 945 | 950 | 955 | 960 |
| Asn | Asp | Ser | Leu | Asn | Ser | Val | Ser | Ser | Ser | Asp | Gly | Tyr | Gly | Lys | Arg | 965 | 970 | 975 | |
| Gly | Gln | Met | Lys | Pro | Ser | Ile | Glu | Ser | Tyr | Ser | Glu | Asp | Asp | Glu | Ser | 980 | 985 | 990 | |

| | | | | | | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|--|
| Lys | Phe | Cys | Ser | Tyr | Gly | Gln | Tyr | Pro | Ala | Asp | Leu | Ala | His | Lys | Ile | | |
| | | 995 | | | | | 1000 | | | | | 1005 | | | | | |
| His | Ser | Ala | Asn | His | Met | Asp | Asp | Asn | Asp | Gly | Glu | Leu | Asp | Thr | Pro | | |
| | 1010 | | | | | 1015 | | | | | 1020 | | | | | | |
| Ile | Asn | Tyr | Ser | Leu | Lys | Tyr | Ser | Asp | Glu | Gln | Leu | Asn | Ser | Gly | Arg | | |
| 1025 | | | | | 1030 | | | | | 1035 | | | | | 1040 | | |
| Gln | Ser | Pro | Ser | Gln | Asn | Glu | Arg | Trp | Ala | Arg | Pro | Lys | His | Ile | Ile | | |
| | | | | 1045 | | | | | 1050 | | | | | 1055 | | | |
| Glu | Asp | Glu | Ile | Lys | Gln | Ser | Glu | Gln | Arg | Gln | Ser | Arg | Asn | Gln | Ser | | |
| | | | 1060 | | | | | 1065 | | | | | 1070 | | | | |
| Thr | Thr | Tyr | Pro | Val | Tyr | Thr | Glu | Ser | Thr | Asp | Asp | Lys | His | Leu | Lys | | |
| | | 1075 | | | | | 1080 | | | | | 1085 | | | | | |
| Phe | Gln | Pro | His | Phe | Gly | Gln | Gln | Glu | Cys | Val | Ser | Pro | Tyr | Arg | Ser | | |
| | 1090 | | | | | 1095 | | | | | 1100 | | | | | | |
| Arg | Gly | Ala | Asn | Gly | Ser | Glu | Thr | Asn | Arg | Val | Gly | Ser | Asn | His | Gly | | |
| 1105 | | | | | 1110 | | | | | 1115 | | | | | 1120 | | |
| Ile | Asn | Gln | Asn | Val | Ser | Gln | Ser | Leu | Cys | Gln | Glu | Asp | Asp | Tyr | Glu | | |
| | | | | 1125 | | | | | 1130 | | | | | 1135 | | | |
| Asp | Asp | Lys | Pro | Thr | Asn | Tyr | Ser | Glu | Arg | Tyr | Ser | Glu | Glu | Glu | Gln | | |
| | | | 1140 | | | | | 1145 | | | | 1150 | | | | | |
| His | Glu | Glu | Glu | Glu | Arg | Pro | Thr | Asn | Tyr | Ser | Ile | Lys | Tyr | Asn | Glu | | |
| | | 1155 | | | | | 1160 | | | | | 1165 | | | | | |
| Glu | Lys | Arg | His | Val | Asp | Gln | Pro | Ile | Asp | Tyr | Ser | Ile | Leu | Lys | Ala | | |
| | 1170 | | | | | 1175 | | | | | 1180 | | | | | | |
| Thr | Asp | Ile | Pro | Ser | Ser | Gln | Lys | Gln | Ser | Phe | Ser | Phe | Ser | Lys | Ser | | |
| 1185 | | | | | 1190 | | | | | 1195 | | | | | 1200 | | |
| Ser | Ser | Gly | Gln | Ser | Ser | Lys | Thr | Glu | His | Met | Ser | Ser | Ser | Ser | Glu | | |
| | | | | 1205 | | | | | 1210 | | | | | | 1215 | | |
| Asn | Thr | Ser | Thr | Pro | Ser | Ser | Asn | Ala | Lys | Arg | Gln | Asn | Gln | Leu | His | | |
| | | | 1220 | | | | | 1225 | | | | | 1230 | | | | |
| Pro | Ser | Ser | Ala | Gln | Ser | Arg | Ser | Gly | Gln | Pro | Gln | Lys | Ala | Ala | Thr | | |
| | | | 1235 | | | | | 1240 | | | | 1245 | | | | | |
| Cys | Lys | Val | Ser | Ser | Ile | Asn | Gln | Glu | Thr | Ile | Gln | Thr | Tyr | Cys | Val | | |
| | 1250 | | | | | 1255 | | | | | 1260 | | | | | | |
| Glu | Asp | Thr | Pro | Ile | Cys | Phe | Ser | Arg | Cys | Ser | Ser | Leu | Ser | Ser | Leu | | |
| 1265 | | | | | 1270 | | | | | 1275 | | | | | 1280 | | |
| Ser | Ser | Ala | Glu | Asp | Glu | Ile | Gly | Cys | Asn | Gln | Thr | Thr | Gln | Glu | Ala | | |
| | | | | 1285 | | | | 1290 | | | | | | 1295 | | | |
| Asp | Ser | Ala | Asn | Thr | Leu | Gln | Ile | Ala | Glu | Ile | Lys | Glu | Lys | Ile | Gly | | |
| | | | 1300 | | | | | 1305 | | | | | 1310 | | | | |
| Thr | Arg | Ser | Ala | Glu | Asp | Pro | Val | Ser | Glu | Val | Pro | Ala | Val | Ser | Gln | | |
| | | 1315 | | | | | 1320 | | | | | 1325 | | | | | |
| His | Pro | Arg | Thr | Lys | Ser | Ser | Arg | Leu | Gln | Gly | Ser | Ser | Leu | Ser | Ser | | |
| | 1330 | | | | | 1335 | | | | | 1340 | | | | | | |
| Glu | Ser | Ala | Arg | His | Lys | Ala | Val | Glu | Phe | Ser | Ser | Gly | Ala | Lys | Ser | | |
| 1345 | | | | | 1350 | | | | | 1355 | | | | | 1360 | | |

Pro Ser Lys Ser Gly Ala Gln Thr Pro Lys Ser Pro Pro Glu His Tyr
1365 1370 1375

Val Gln Glu Thr Pro Leu Met Phe Ser Arg Cys Thr Ser Val Ser Ser
1380 1385 1390

Leu Asp Ser Phe Glu Ser Arg Ser Ile Ala Ser Ser Val Gln Ser Glu
1395 1400 1405

Pro Cys Ser Gly Met Val Ser Gly Ile Ile Ser Pro Ser Asp Leu Pro
1410 1415 1420

Asp Ser Pro Gly Gln Thr Met Pro Pro Ser Arg Ser Lys Thr Pro Pro
1425 1430 1435 1440

Pro Pro Pro Gln Thr Ala Gln Thr Lys Arg Glu Val Pro Lys Asn Lys
1445 1450 1455

Ala Pro Thr Ala Glu Lys Arg Glu Ser Gly Pro Lys Gln Ala Ala Val
1460 1465 1470

Asn Ala Ala Val Gln Arg Val Gln Val Leu Pro Asp Ala Asp Thr Leu
1475 1480 1485

Leu His Phe Ala Thr Glu Ser Thr Pro Asp Gly Phe Ser Cys Ser Ser
1490 1495 1500

Ser Leu Ser Ala Leu Ser Leu Asp Glu Pro Phe Ile Gln Lys Asp Val
1505 1510 1515 1520

Glu Leu Arg Ile Met Pro Pro Val Gln Glu Asn Asp Asn Gly Asn Glu
1525 1530 1535

Thr Glu Ser Glu Gln Pro Lys Glu Ser Asn Glu Asn Gln Glu Lys Glu
1540 1545 1550

Ala Glu Lys Thr Ile Asp Ser Glu Lys Asp Leu Leu Asp Asp Ser Asp
1555 1560 1565

Asp Asp Asp Ile Glu Ile Leu Glu Glu Cys Ile Ile Ser Ala Met Pro
1570 1575 1580

Thr Lys Ser Ser Arg Lys Ala Lys Lys Pro Ala Gln Thr Ala Ser Lys
1585 1590 1595 1600

Leu Pro Pro Pro Val Ala Arg Lys Pro Ser Gln Leu Pro Val Tyr Lys
1605 1610 1615

Leu Leu Pro Ser Gln Asn Arg Leu Gln Pro Gln Lys His Val Ser Phe
1620 1625 1630

Thr Pro Gly Asp Asp Met Pro Arg Val Tyr Cys Val Glu Gly Thr Pro
1635 1640 1645

Ile Asn Phe Ser Thr Ala Thr Ser Leu Ser Asp Leu Thr Ile Glu Ser
1650 1655 1660

Pro Pro Asn Glu Leu Ala Ala Gly Glu Gly Val Arg Gly Gly Ala Gln
1665 1670 1675 1680

Ser Gly Glu Phe Glu Lys Arg Asp Thr Ile Pro Thr Glu Gly Arg Ser
1685 1690 1695

Thr Asp Glu Ala Gln Gly Gly Lys Thr Ser Ser Val Thr Ile Pro Glu
1700 1705 1710

Leu Asp Asp Asn Lys Ala Glu Glu Gly Asp Ile Leu Ala Glu Cys Ile
1715 1720 1725

| | | | | | | | | | | | | | | | | |
|-------------|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|--|
| Asn 1730 | Ser | Ala | Met | Pro | Lys | Gly | Lys | Ser | His | Lys | Pro | Phe | Arg | Val | Lys | |
| | | | | | | 1735 | | | | | 1740 | | | | | |
| Lys 1745 | Ile | Met | Asp | Gln | Val | Gln | Gln | Ala | Ser | Ala | Ser | Ser | Ser | Ala | Pro | |
| | | | | | 1750 | | | | | 1755 | | | | | 1760 | |
| Asn 1765 | Lys | Asn | Gln | Leu | Asp | Gly | Lys | Lys | Lys | Lys | Pro | Thr | Ser | Pro | Val | |
| | | | | 1765 | | | | | 1770 | | | | | 1775 | | |
| Lys 1780 | Pro | Ile | Pro | Gln | Asn | Thr | Glu | Tyr | Arg | Thr | Arg | Val | Arg | Lys | Asn | |
| | | | 1780 | | | | 1785 | | | | | | 1790 | | | |
| Ala 1795 | Asp | Ser | Lys | Asn | Asn | Leu | Asn | Ala | Glu | Arg | Val | Phe | Ser | Asp | Asn | |
| | | | 1795 | | | | 1800 | | | | | 1805 | | | | |
| Lys 1810 | Asp | Ser | Lys | Lys | Gln | Asn | Leu | Lys | Asn | Asn | Ser | Lys | Asp | Phe | Asn | |
| | | | | | 1815 | | | | | | 1820 | | | | | |
| Asp 1825 | Lys | Leu | Pro | Asn | Asn | Glu | Asp | Arg | Val | Arg | Gly | Ser | Phe | Ala | Phe | |
| | | | | | 1830 | | | | | 1835 | | | | | 1840 | |
| Asp 1845 | Ser | Pro | His | His | Tyr | Thr | Pro | Ile | Glu | Gly | Thr | Pro | Tyr | Cys | Phe | |
| | | | | 1845 | | | | | 1850 | | | | | 1855 | | |
| Ser 1860 | Arg | Asn | Asp | Ser | Leu | Ser | Ser | Leu | Asp | Phe | Asp | Asp | Asp | Asp | Val | |
| | | | 1860 | | | | | 1865 | | | | | 1870 | | | |
| Asp 1875 | Leu | Ser | Arg | Glu | Lys | Ala | Glu | Leu | Arg | Lys | Ala | Lys | Glu | Asn | Lys | |
| | | | | | | | 1880 | | | | | 1885 | | | | |
| Glu 1890 | Ser | Glu | Ala | Lys | Val | Thr | Ser | His | Thr | Glu | Leu | Thr | Ser | Asn | Gln | |
| | | | | | | 1895 | | | | | 1900 | | | | | |
| Gln 1905 | Ser | Ala | Asn | Lys | Thr | Gln | Ala | Ile | Ala | Lys | Gln | Pro | Ile | Asn | Arg | |
| | | | | | 1910 | | | | | 1915 | | | | | 1920 | |
| Gly 1925 | Gln | Pro | Lys | Pro | Ile | Leu | Gln | Lys | Gln | Ser | Thr | Phe | Pro | Gln | Ser | |
| | | | | | 1925 | | | | 1930 | | | | | 1935 | | |
| Ser 1940 | Lys | Asp | Ile | Pro | Asp | Arg | Gly | Ala | Ala | Thr | Asp | Glu | Lys | Leu | Gln | |
| | | | | | | | 1945 | | | | | | 1950 | | | |
| Asn 1955 | Phe | Ala | Ile | Glu | Asn | Thr | Pro | Val | Cys | Phe | Ser | His | Asn | Ser | Ser | |
| | | | | | | | 1960 | | | | | 1965 | | | | |
| Leu 1970 | Ser | Ser | Leu | Ser | Asp | Ile | Asp | Gln | Glu | Asn | Asn | Asn | Lys | Glu | Asn | |
| | | | | | | 1975 | | | | | 1980 | | | | | |
| Glu 1985 | Pro | Ile | Lys | Glu | Thr | Glu | Pro | Pro | Asp | Ser | Gln | Gly | Glu | Pro | Ser | |
| | | | | | 1990 | | | | 1995 | | | | | 2000 | | |
| Lys 2005 | Pro | Gln | Ala | Ser | Gly | Tyr | Ala | Pro | Lys | Ser | Phe | His | Val | Glu | Asp | |
| | | | | | 2005 | | | | 2010 | | | | | 2015 | | |
| Thr 2020 | Pro | Val | Cys | Phe | Ser | Arg | Asn | Ser | Ser | Leu | Ser | Ser | Leu | Ser | Ile | |
| | | | | | | | 2025 | | | | | | 2030 | | | |
| Asp 2035 | Ser | Glu | Asp | Asp | Leu | Leu | Gln | Glu | Cys | Ile | Ser | Ser | Ala | Met | Pro | |
| | | | | | | | 2040 | | | | | 2045 | | | | |
| Lys 2050 | Lys | Lys | Lys | Pro | Ser | Arg | Leu | Lys | Gly | Asp | Asn | Glu | Lys | His | Ser | |
| | | | | | | 2055 | | | | | 2060 | | | | | |
| Pro 2065 | Arg | Asn | Met | Gly | Gly | Ile | Leu | Gly | Glu | Asp | Leu | Thr | Leu | Asp | Leu | |
| | | | | | 2070 | | | | 2075 | | | | | | 2080 | |
| Lys 2085 | Asp | Ile | Gln | Arg | Pro | Asp | Ser | Glu | His | Gly | Leu | Ser | Pro | Asp | Ser | |
| | | | | | | | | | 2090 | | | | | 2095 | | |

| | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| Glu | Asn | Phe | Asp | Trp | Lys | Ala | Ile | Gln | Glu | Gly | Ala | Asn | Ser | Ile | Val | 2100 | 2105 | 2110 |
| Ser | Ser | Leu | His | Gln | Ala | Ala | Ala | Ala | Ala | Cys | Leu | Ser | Arg | Gln | Ala | 2115 | 2120 | 2125 |
| Ser | Ser | Asp | Ser | Asp | Ser | Ile | Leu | Ser | Leu | Lys | Ser | Gly | Ile | Ser | Leu | 2130 | 2135 | 2140 |
| Gly | Ser | Pro | Phe | His | Leu | Thr | Pro | Asp | Gln | Glu | Glu | Lys | Pro | Phe | Thr | 2145 | 2150 | 2155 |
| Ser | Asn | Lys | Gly | Pro | Arg | Ile | Leu | Lys | Pro | Gly | Glu | Lys | Ser | Thr | Leu | 2165 | 2170 | 2175 |
| Glu | Thr | Lys | Lys | Ile | Glu | Ser | Glu | Ser | Lys | Gly | Ile | Lys | Gly | Gly | Lys | 2180 | 2185 | 2190 |
| Lys | Val | Tyr | Lys | Ser | Leu | Ile | Thr | Gly | Lys | Val | Arg | Ser | Asn | Ser | Glu | 2195 | 2200 | 2205 |
| Ile | Ser | Gly | Gln | Met | Lys | Gln | Pro | Leu | Gln | Ala | Asn | Met | Pro | Ser | Ile | 2210 | 2215 | 2220 |
| Ser | Arg | Gly | Arg | Thr | Met | Ile | His | Ile | Pro | Gly | Val | Arg | Asn | Ser | Ser | 2225 | 2230 | 2235 |
| Ser | Ser | Thr | Ser | Pro | Val | Ser | Lys | Lys | Gly | Pro | Pro | Leu | Lys | Thr | Pro | 2245 | 2250 | 2255 |
| Ala | Ser | Lys | Ser | Pro | Ser | Glu | Gly | Gln | Thr | Ala | Thr | Thr | Ser | Pro | Arg | 2260 | 2265 | 2270 |
| Gly | Ala | Lys | Pro | Ser | Val | Lys | Ser | Glu | Leu | Ser | Pro | Val | Ala | Arg | Gln | 2275 | 2280 | 2285 |
| Thr | Ser | Gln | Ile | Gly | Gly | Ser | Ser | Lys | Ala | Pro | Ser | Arg | Ser | Gly | Ser | 2290 | 2295 | 2300 |
| Arg | Asp | Ser | Thr | Pro | Ser | Arg | Pro | Ala | Gln | Gln | Pro | Leu | Ser | Arg | Pro | 2305 | 2310 | 2315 |
| Ile | Gln | Ser | Pro | Gly | Arg | Asn | Ser | Ile | Ser | Pro | Gly | Arg | Asn | Gly | Ile | 2325 | 2330 | 2335 |
| Ser | Pro | Pro | Asn | Lys | Ile | Ser | Gln | Leu | Pro | Arg | Thr | Ser | Ser | Pro | Ser | 2340 | 2345 | 2350 |
| Thr | Ala | Ser | Thr | Lys | Ser | Ser | Gly | Ser | Gly | Lys | Met | Ser | Tyr | Thr | Ser | 2355 | 2360 | 2365 |
| Pro | Gly | Arg | Gln | Met | Ser | Gln | Gln | Asn | Leu | Thr | Lys | Gln | Thr | Gly | Leu | 2370 | 2375 | 2380 |
| Ser | Lys | Asn | Ala | Ser | Ser | Ile | Pro | Arg | Ser | Glu | Ser | Ala | Ser | Lys | Gly | 2385 | 2390 | 2395 |
| Leu | Asn | Gln | Met | Asn | Asn | Gly | Asn | Gly | Ala | Asn | Lys | Lys | Val | Glu | Leu | 2405 | 2410 | 2415 |
| Ser | Arg | Met | Ser | Ser | Thr | Lys | Ser | Ser | Gly | Ser | Glu | Ser | Asp | Arg | Ser | 2420 | 2425 | 2430 |
| Glu | Arg | Pro | Val | Leu | Val | Arg | Gln | Ser | Thr | Phe | Ile | Lys | Glu | Ala | Pro | 2435 | 2440 | 2445 |
| Ser | Pro | Thr | Leu | Arg | Arg | Lys | Leu | Glu | Glu | Ser | Ala | Ser | Phe | Glu | Ser | 2450 | 2455 | 2460 |

| | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| Leu | Ser | Pro | Ser | Ser | Arg | Pro | Ala | Ser | Pro | Thr | Arg | Ser | Gln | Ala | Gln | 2465 | 2470 | 2475 | 2480 |
| Thr | Pro | Val | Leu | Ser | Pro | Ser | Leu | Pro | Asp | Met | Ser | Leu | Ser | Thr | His | 2485 | 2490 | 2495 | |
| Ser | Ser | Val | Gln | Ala | Gly | Gly | Trp | Arg | Lys | Leu | Pro | Pro | Asn | Leu | Ser | 2500 | 2505 | 2510 | |
| Pro | Thr | Ile | Glu | Tyr | Asn | Asp | Gly | Arg | Pro | Ala | Lys | Arg | His | Asp | Ile | 2515 | 2520 | 2525 | |
| Ala | Arg | Ser | His | Ser | Glu | Ser | Pro | Ser | Arg | Leu | Pro | Ile | Asn | Arg | Ser | 2530 | 2535 | 2540 | |
| Gly | Thr | Trp | Lys | Arg | Glu | His | Ser | Lys | His | Ser | Ser | Ser | Leu | Pro | Arg | 2545 | 2550 | 2555 | 2560 |
| Val | Ser | Thr | Trp | Arg | Arg | Thr | Gly | Ser | Ser | Ser | Ser | Ile | Leu | Ser | Ala | 2565 | 2570 | 2575 | |
| Ser | Ser | Glu | Ser | Ser | Glu | Lys | Ala | Lys | Ser | Glu | Asp | Glu | Lys | His | Val | 2580 | 2585 | 2590 | |
| Asn | Ser | Ile | Ser | Gly | Thr | Lys | Gln | Ser | Lys | Glu | Asn | Gln | Val | Ser | Ala | 2595 | 2600 | 2605 | |
| Lys | Gly | Thr | Trp | Arg | Lys | Ile | Lys | Glu | Asn | Glu | Phe | Ser | Pro | Thr | Asn | 2610 | 2615 | 2620 | |
| Ser | Thr | Ser | Gln | Thr | Val | Ser | Ser | Gly | Ala | Thr | Asn | Gly | Ala | Glu | Ser | 2625 | 2630 | 2635 | 2640 |
| Lys | Thr | Leu | Ile | Tyr | Gln | Met | Ala | Pro | Ala | Val | Ser | Lys | Thr | Glu | Asp | 2645 | 2650 | 2655 | |
| Val | Trp | Val | Arg | Ile | Glu | Asp | Cys | Pro | Ile | Asn | Asn | Pro | Arg | Ser | Gly | 2660 | 2665 | 2670 | |
| Arg | Ser | Pro | Thr | Gly | Asn | Thr | Pro | Pro | Val | Ile | Asp | Ser | Val | Ser | Glu | 2675 | 2680 | 2685 | |
| Lys | Ala | Asn | Pro | Asn | Ile | Lys | Asp | Ser | Lys | Asp | Asn | Gln | Ala | Lys | Gln | 2690 | 2695 | 2700 | |
| Asn | Val | Gly | Asn | Gly | Ser | Val | Pro | Met | Arg | Thr | Val | Gly | Leu | Glu | Asn | 2705 | 2710 | 2715 | 2720 |
| Arg | Leu | Asn | Ser | Phe | Ile | Gln | Val | Asp | Ala | Pro | Asp | Gln | Lys | Gly | Thr | 2725 | 2730 | 2735 | |
| Glu | Ile | Lys | Pro | Gly | Gln | Asn | Asn | Pro | Val | Pro | Val | Ser | Glu | Thr | Asn | 2740 | 2745 | 2750 | |
| Glu | Ser | Ser | Ile | Val | Glu | Arg | Thr | Pro | Phe | Ser | Ser | Ser | Ser | Ser | Ser | 2755 | 2760 | 2765 | |
| Lys | His | Ser | Ser | Pro | Ser | Gly | Thr | Val | Ala | Ala | Arg | Val | Thr | Pro | Phe | 2770 | 2775 | 2780 | |
| Asn | Tyr | Asn | Pro | Ser | Pro | Arg | Lys | Ser | Ser | Ala | Asp | Ser | Thr | Ser | Ala | 2785 | 2790 | 2795 | 2800 |
| Arg | Pro | Ser | Gln | Ile | Pro | Thr | Pro | Val | Asn | Asn | Asn | Thr | Lys | Lys | Arg | 2805 | 2810 | 2815 | |
| Asp | Ser | Lys | Thr | Asp | Ser | Thr | Glu | Ser | Ser | Gly | Thr | Gln | Ser | Pro | Lys | 2820 | 2825 | 2830 | |

Arg His Ser Gly Ser Tyr Leu Val Thr Ser Val
2835 2840

(2) INFORMATION FOR SEQ ID NO:31:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 65 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: other nucleic acid

(iii) HYPOTHETICAL: NO

(iv) ANTI-SENSE: NO

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:31:

CGGAATTCNN NNNNNNNAAC AGCNNNNNNN NNAATGAANN NCAAGTCTG NNNTGAGGAT 60
CCTCA 65

(2) INFORMATION FOR SEQ ID NO:32:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 65 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: other nucleic acid

(iv) ANTI-SENSE: NO

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:32:

CGGAATTCGA CTCAGAANNN NNNAATTCA GANNNNNNAT CNNNNNNNNN GTCTGAGGAT 60
CCTCA 65

(2) INFORMATION FOR SEQ ID NO:33:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 65 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: other nucleic acid

(iv) ANTI-SENSE: NO

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:33:

CGGAATTCNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNNNNNNNN NNNTGAGGAT 60
CCTCA 65